AFM-Based Fabrication of Nanofluidic Device for Medical Application

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Recent developments in science and engineering have advanced the atomic manufacture of nanoscale structures, allowing for improved high-performance technologies. Among them, AFM-based nanomachining is considered a potential manufacturing tool for operations including machining, patterning, and assembling with *in situ* metrology and visualization. In this work, atomic force microscope (AFM) is employed in the fabrication of nanofluidic device for DNA stretching application. Nanofluidic channels with various depths and widths are fabricated using AFM indentation and scratching techniques. To introduce the fluid inside the nanochannels, microchannels are made on both sides of the nanochannels. Photolithography technique is used to fabricate microfluidic channels on silicon wafers. A 3D Molecular Dynamics (MD) model is used to guide the design and fabrication of nanodevices through nanoscratching. The correlation between the scratching conditions, including applied force, scratching depth, and distant between any two scratched grooves and the defect mechanism in the substrate/workpiece is investigated. The MD model allows proper process parameter identification resulting in more accurate nanochannel size.

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